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In another paper the same author offers observations on *"the Effects of an Observer's Conditions on his Perception of an Earthquake."* This means that, while the maximum of frequency as registered by instruments occurs about noon, the one based on personal observations occurs at 10 P.M. and at 2 A.M., viz.: at times when quiet prevails or, aroused from their first sleep, people will lie awake and be sensitive to the slightest tremors. Furthermore, observers indoors describe identical shocks as longer than do those who feel them outdoors. Observers in town, too, often mistake artificial tremors for genuine earthquakes and compare the sounds to passing wagons, etc., while the rural observer likens them to thunder, wind, etc. The position of houses influences observations in so far as shocks are more readily felt in buildings whose main walls stand perpendicularly to the direction of the shock. In badly built houses, shocks are felt more strongly on the upper stories than on the ground floor. Persons just roused from sleep describe the same shock very differently from those who were awake when it came. Thus, records of intensity, duration, direction, audibility, and nature of sound may be biassed by subjective conditions for which allowance must be made in working up personal observations.

In a third paper: *"Ostasiatischer Erdbebenkatalog,"* Dr. E. Rudolph reproduces the observations made at the seismic and meteorological stations of Tokio, Manila, Batavia, Koeta Radja (Atjeh, Sumatra), and Si-ka-wei (Shang-hai). He reiterates De Ballore's plea for a more even distribution of seismological stations in the far East.

Wilhelm Krebs (*Staubfälle, besonders im Passatgebiet des nördlichen Atlantik*) records observations on atmospheric dust from the log books of German merchantmen in the region of the North Atlantic trade belt, pointing out the parallelism between the increased frequency of this phenomenon and the volcanic activities of 1901-1903.

Dr. Th. Arldt (*Parallelismus auf der Erdoberfläche*) presents tables and formulas for the measuring of absolute, orthodromic, and loxodromic, parallelism by means of which the arrangement of the tectonic features of the earth's surface may be mathematically determined; Karl Fuchs (*Wirkung der fluterzeugenden Kräfte auf die Massenelemente*) describes a method of deriving local effects of the tide-producing forces from local conditions, and Dr. G. Greim (*Studien aus dem Paznaun II. Der Jamtalferner*) contributes a paper and map on observations made at the Jam Valley glacier which prove a recession of glaciation in that valley.

M. K. G.

Höhlenkunde, mit Berücksichtigung der Karstphänomene. Von W. v. Knebel. Braunschweig, Friedrich Vieweg und Sohn, 1906. 42 Illustrations and 4 Plates. (Price, M. 5.50.)

For purposes of classification, the author distinguishes between caves of primary origin (*ursprüngliche Höhlen*), viz.: caves formed during the process of formation of the rocks in which they are found, and caves of secondary origin (*später gebildete Höhlen*), viz.: such as were hollowed out of the existing rock by outside agencies—water, wind, etc. Among the former the most important are the lava caves, formed by a stream of lava flowing away under the hardened surface of the flow and leaving a cavity under that surface, as, for instance, the Surtshellir Cave in Iceland. Caves of secondary origin are either genuine (*echte*) or pseudo-caves (*Halbhöhlen*), the latter including sea-caves, desert-caves (due to wind erosion), glacier-caves, and the like. Genuine caves are geographically associated with, and form a characteristic feature of, the Karst type of landscape, and a scientific study of them cannot, therefore, be satisfactory unless it is carried on as a study of the Karst problem as well. Hence the title of the book. It is the hydrographic conditions of limestone and dolomite regions which bring about the process known as *Verkarstung* of which the formation of caverns is a part. These rocks are easily decomposed by running water and are, also, often full of cracks and fissures which offer the latter so many lines of attack. The result is a system of drainage very different from that in other regions where the water flows in surface streams. As it permeates into the ground more or less vertically, and does not, to a large extent, start on a horizontal motion before it reaches the bottom layer, the author distinguishes the drainage of Karst regions as vertical or bottom drainage from the regular horizontal or surface drainage. In this way, Karst regions produce a system of subterranean water-courses or "cave rivers" (Höhlenflüsse) on which the author's explanation of the cave and Karst phenomena is pre-eminently based.

In speaking of underground waters, the author distinguishes between the permanent ground water and subterranean water-courses. He opposes the theory brought forward by Grund, that it is the former that collects, or connects the individual parts of, the partially engulfed rivers common in Karst regions. While admitting that this may be the case in some instances, he strongly opposes a sweeping generalization which would make it the only possible explanation of the problem. Actual observations of well-known subterranean connections between different rivers, especially of the Danube-Rhine connection, but also of less famous ones in the Austrian Karst, have proved that subterranean rivers do exist and that, after disappearing at the "*ponor*" (the opening where a river is engulfed), the river may continue its course as an individual river underground and re-appear as what the author calls a *Vaucluse spring* (after the famous one at Vaucluse, in the French Alps), namely, at which, instead of the customary stream of water, a fully developed river pours forth.

More evidence in favor of the author's opinion is given by the existence of submarine springs on Karst coasts. They indicate a sinking of the coast by which a former "Vaucluse" spring which opened on or near the shore has been submerged, while the power of the running water is still strong enough to overcome the pressure of the sea water above it. The fresh water, being lighter, rises to the surface and makes the sea brackish where such springs occur. A more complicated type of submerged Vaucluse springs which is also particular to Karst coasts is the "*Meeresschwinden,*" or places where the sea water is drawn into openings in the coast whose size is out of all proportion to the volume of water that disappears in them. The best known example is the "ocean mills" of Argostoli, on the island of Cephalonia. There 150,000 cubic metres of water are drawn daily into apparently quite insignificant holes in the coast, and the ingoing current is so strong that it drives two mills by means of artificial holes that have been cut down to the underground channel. The explanation of this phenomenon is given through the existence of a subterranean and, later, submarine, water-course. The canal in which this "cave-river" flows sends forth a branch upward which reaches the surface at about sea-level. The water running in the lower canal establishes a suction in the upper that draws the sea water into it and carries it down to the lower where, together with the cave-river, it returns into the ocean below sea-level.

In a similar process of suction the author gives an explanation of the impetus that causes the motion of the cave rivers. The water that escapes at any spring, Vaucluse or ordinary, creates a vacuum back of it which, in its turn, starts a process of suction extending back to the water behind it. Thus a motion is started in the ground water. In proportion as this process of suction extends farther and farther back, it attracts more and more of the percolating waters, thereby increasing its volume and power. The degree to which the rock is shattered, and soluble in water, will give the latter a proportionate degree in hollowing out cavities along its course; hence the frequency of caves in, and the co-incidence of the Karst phenomenon with, limestone and dolomite areas. The more the water hollows out, by decomposition rather than erosion, fully developed canals with a noticeable grade, the more its motion becomes riverlike and ceases to co-incide with the distinctly existing, but far less pronounced one of the ground water proper. When the process has worked back far enough to reach the surface, it creates there an opening which engulfs the stream or river that may be flowing there, and the underground river becomes the continuation of the surface river. When a cave river abandons its canal for another, the formation of stalactites and stalagmites sets in, because it is only possible when the moisture in the cave reaches a certain minimum, so that the percolating water may evaporate. On the surface, sinkholes often indicate the existence of a subterranean river, or at least the former course of one. Some of them are, however, not due to the caving in of the roof of a cavern, but to the decomposition of the rock along more or less perpendicular cracks. Such sinkholes have a shaft-like shape. The term *sinkhole* ought, therefore, not to be used geologically, but morphologically only. A series of sinkholes may form valleys, and this type of valley is another characteristic of the Karst, where genuine erosion plays such a small part in the modeling of the landscape. The author suggests the term *Vaucluse Valley* for this type. Very large sinkholes filled out with alluvial deposits often resemble lake bottoms, while there is no evidence of a former lake. Such circular valleys have the Slav name of *Poljen,* which the author suggests as a technical term to be adopted for that type.

The last chapters of the book are given to the meteorological, biological, and prehistoric aspect of spelæology, and to the economic and agricultural problems of the Karst. It will certainly not fail to reach the purpose for which it was written, namely, to present a scientific treatment of the physical geography of caves in a form that will awaken the interest of the lay reader and enlist his co-operation in the observation of the processes described, in order to increase the as yet scanty material available for scientific investigation. M. K. G.

Colección de Libros y Documentos referentes á la Historia de América. Vol. VII. "El Extrañamiento de los Jesuitas del Rio de la Plata, y de las Misiones del Paraguay. por decreto de Carlos III." A study by Father Pablo Hernandes, S.J. Victoriano Suárez, Madrid, 1908.

This modern book is purely historical, being devoted exclusively to the story of the expulsion of the Jesuits from the La Plata region in the second half of the eighteenth century. A discussion of it, therefore, finds no place in this BULLETIN. We would only say that it is dreary and wearisome reading, and that while it may be of importance for the history of a measure that has wrought much mischief for the Indians in the Spanish-American possessions, it is not free from errors in historical appreciation. To ascribe, for instance, the assassina-